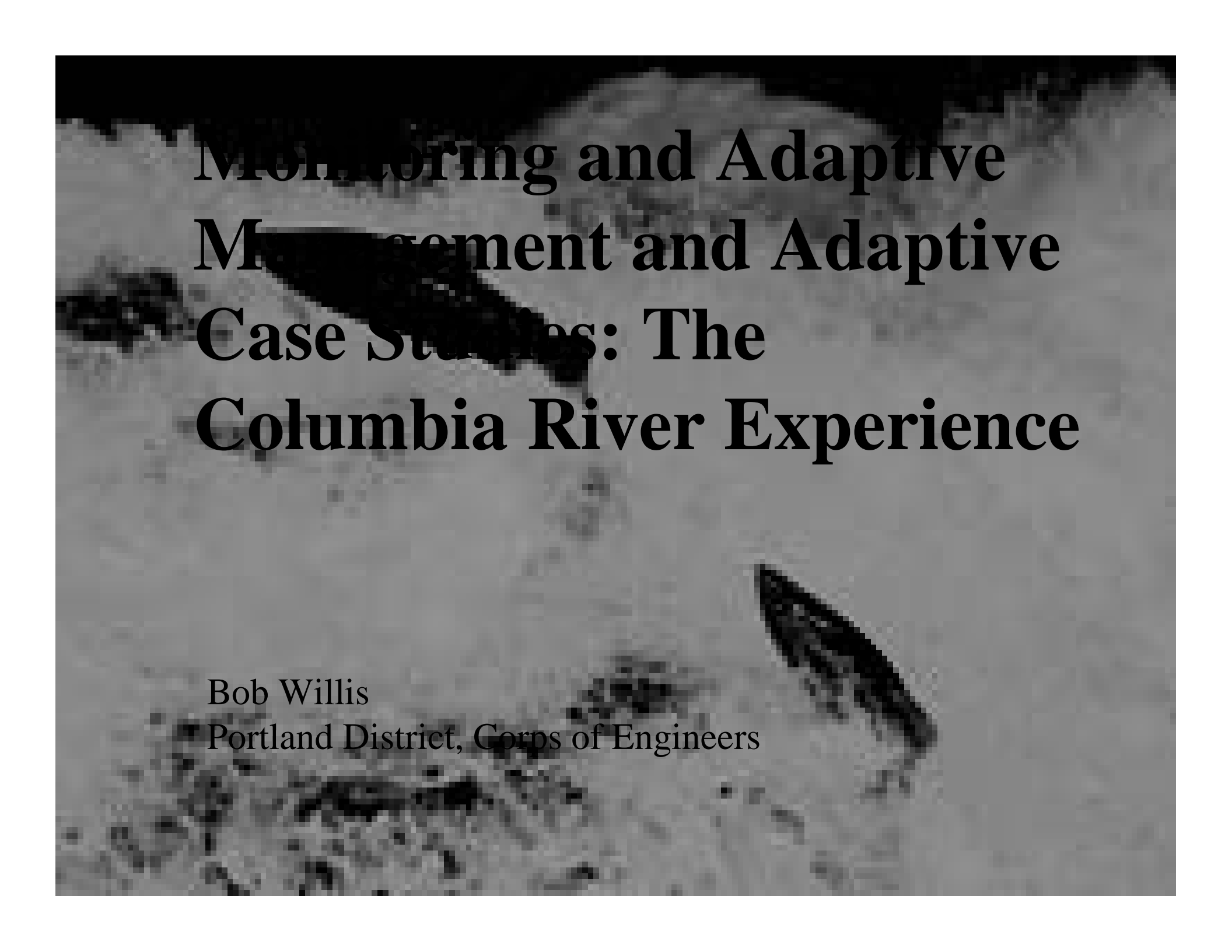




US Army Corps  
of Engineers®

# Economic & Environmental Conference

- **Track C**
  - Risk and uncertainty in NER and monitoring adaptive management for ecosystem restoration.
- **Session II**
  - Monitoring and adaptive management case studies.

A black and white photograph of a river with a large rock in the foreground. The text is overlaid on the image.

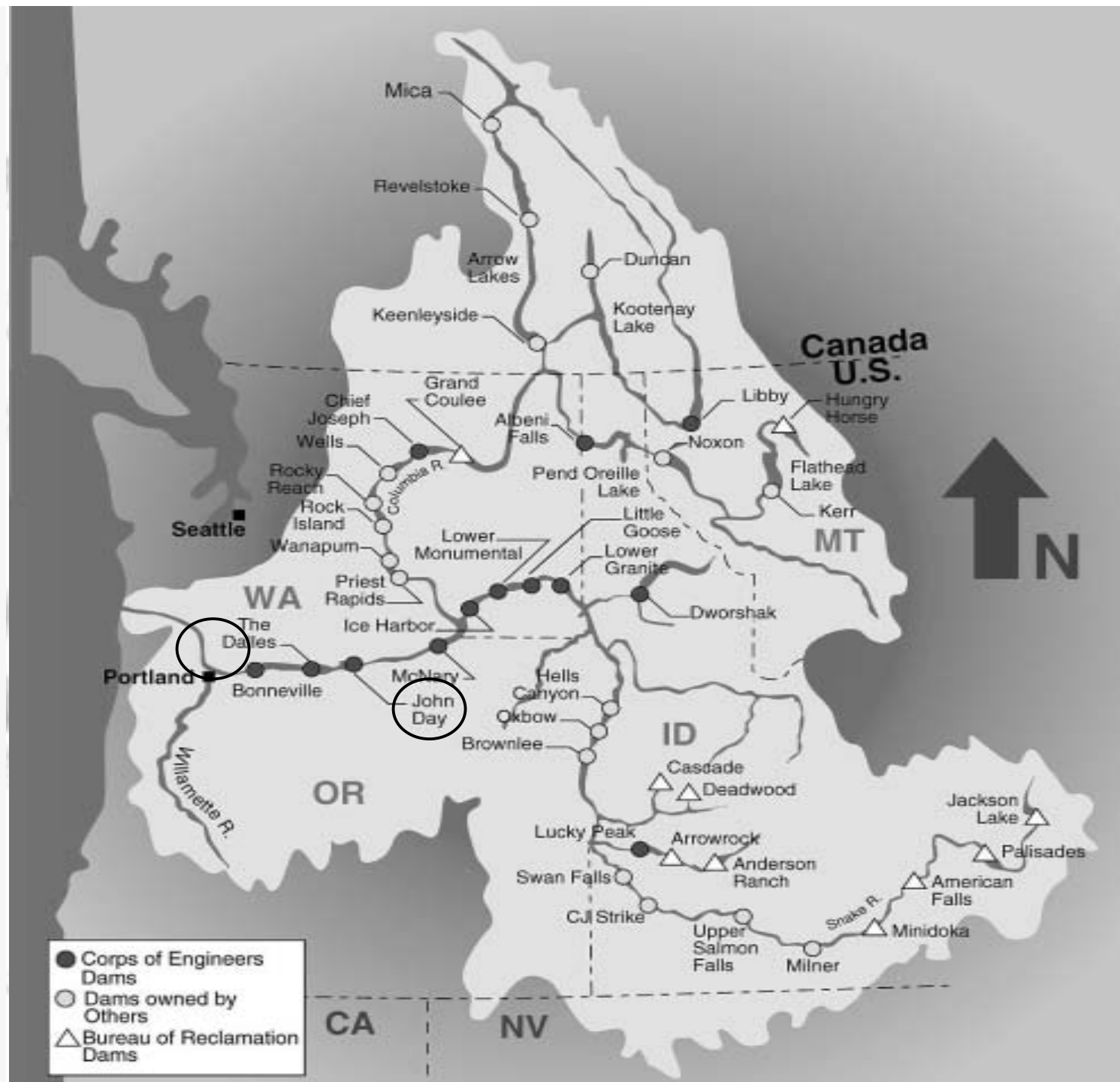
# **Monitoring and Adaptive Management and Adaptive Case Studies: The Columbia River Experience**

Bob Willis

Portland District, Corps of Engineers

# Columbia River Basin Major dams

## John Day Dam & Salmon Creek



• 18 blocks of sand, gravel, and cobble

• 18 blocks of sand, gravel, and cobble

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• 18 blocks of sand, gravel, and cobble

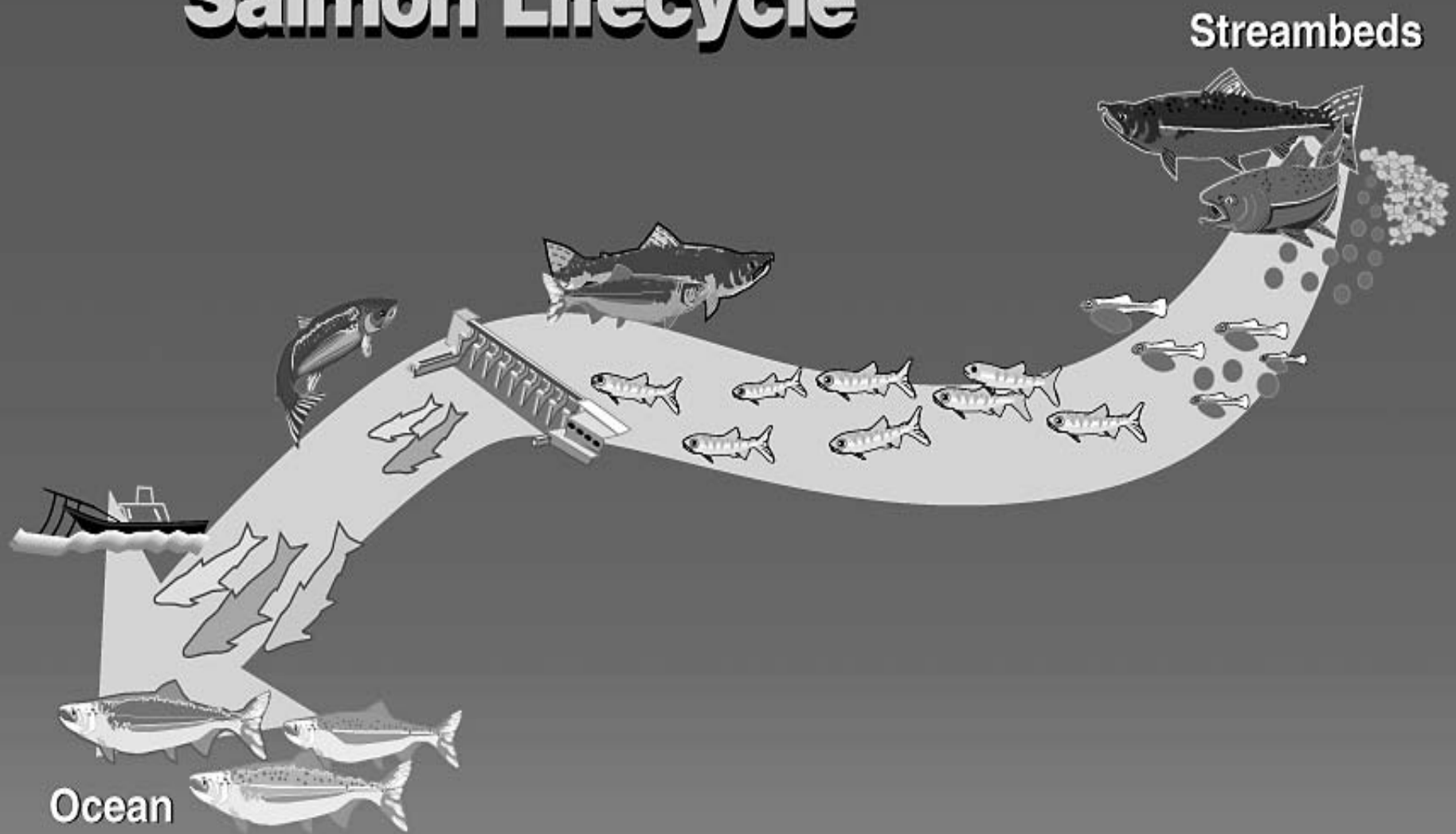
• 18 blocks of sand, gravel, and cobble

• 18 blocks of sand, gravel, and cobble

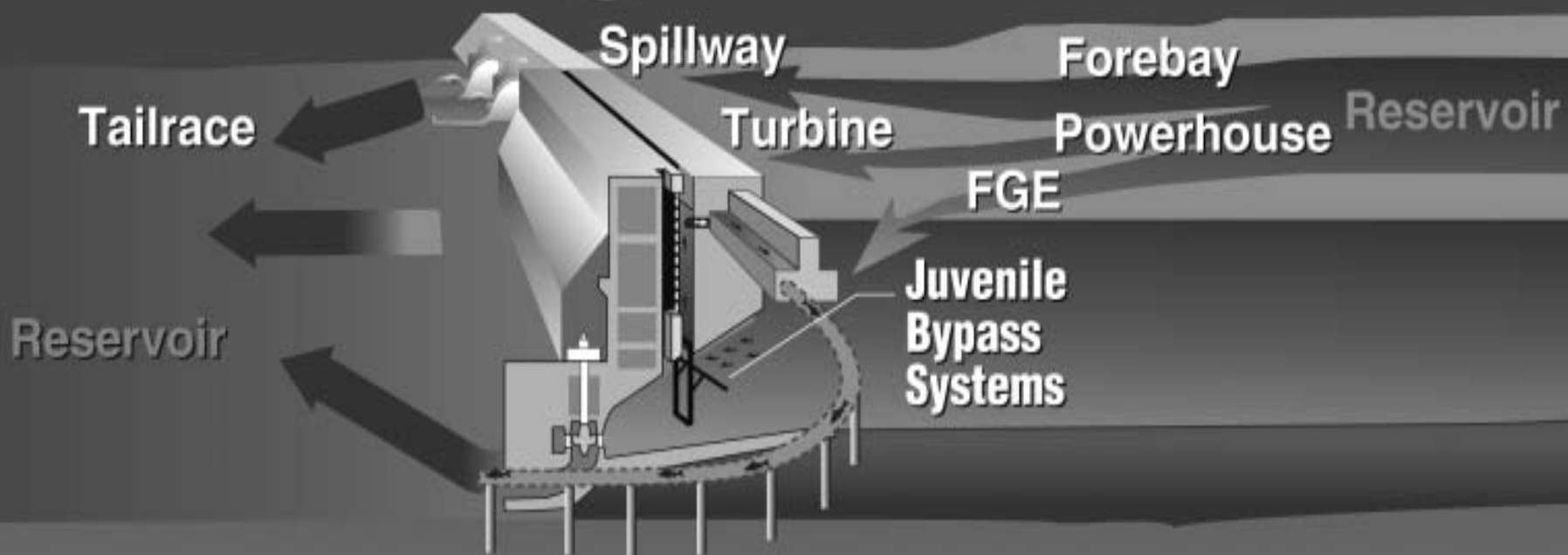
• 18 blocks of sand, gravel, and cobble

• 18 blocks of sand, gravel, and cobble

# Salmon Lifecycle



# Juvenile Passage Routes



# Techniques & Costs

- Balloon Tags
- Radio Telemetry (juvenile & adults)
- Drogues
- Sensor Fish

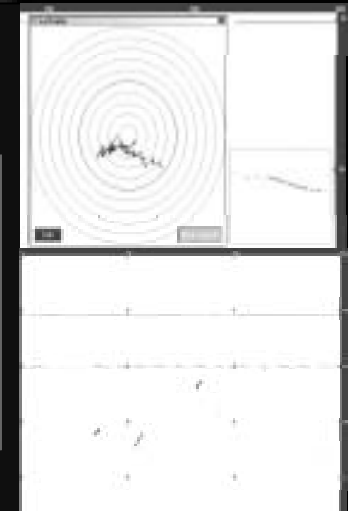
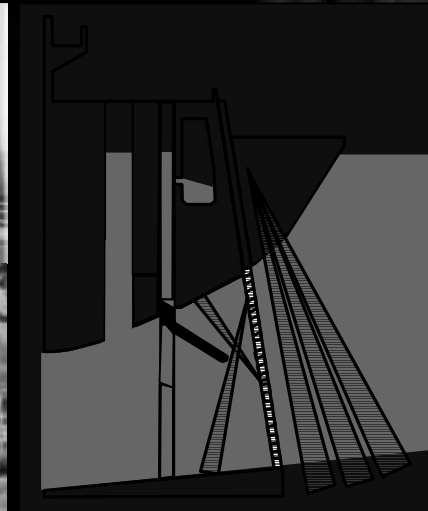
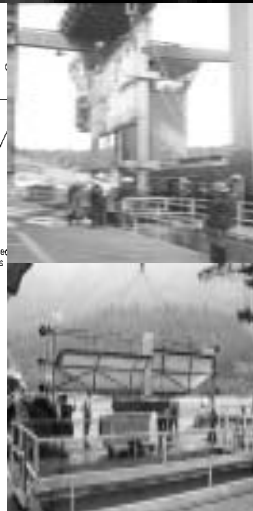
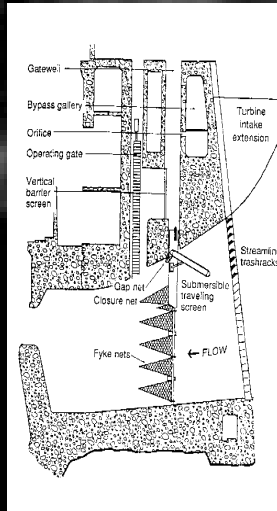




Acoustic Camera

Acoustic Camera

Acoustic Camera





- 
- Groundwater collection
  - Surface collection
  - Bill (sewer & gas)
  - Surface Collection
  - Turbine Improvement
  - Sewer Service

# Fish Passage Existing Systems



**Juvenile Fish  
Transportation**



**Juvenile Bypass System  
Extended Submerged  
Bar Screen**

**Spillway Deflectors  
(flip lips)**

**Adult Fish  
Ladder**

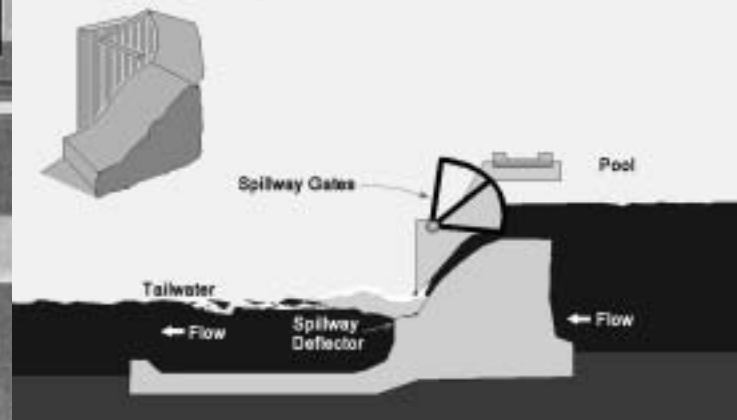
**Spillway**

**Powerhouse**

**Forebay**

**Turbine  
Intake**

**Typical Cross Section Spillway Deflector**



**Juvenile  
Bypass  
Systems**

FFDR  
SRW  
FFDR

FFDR



FFDR

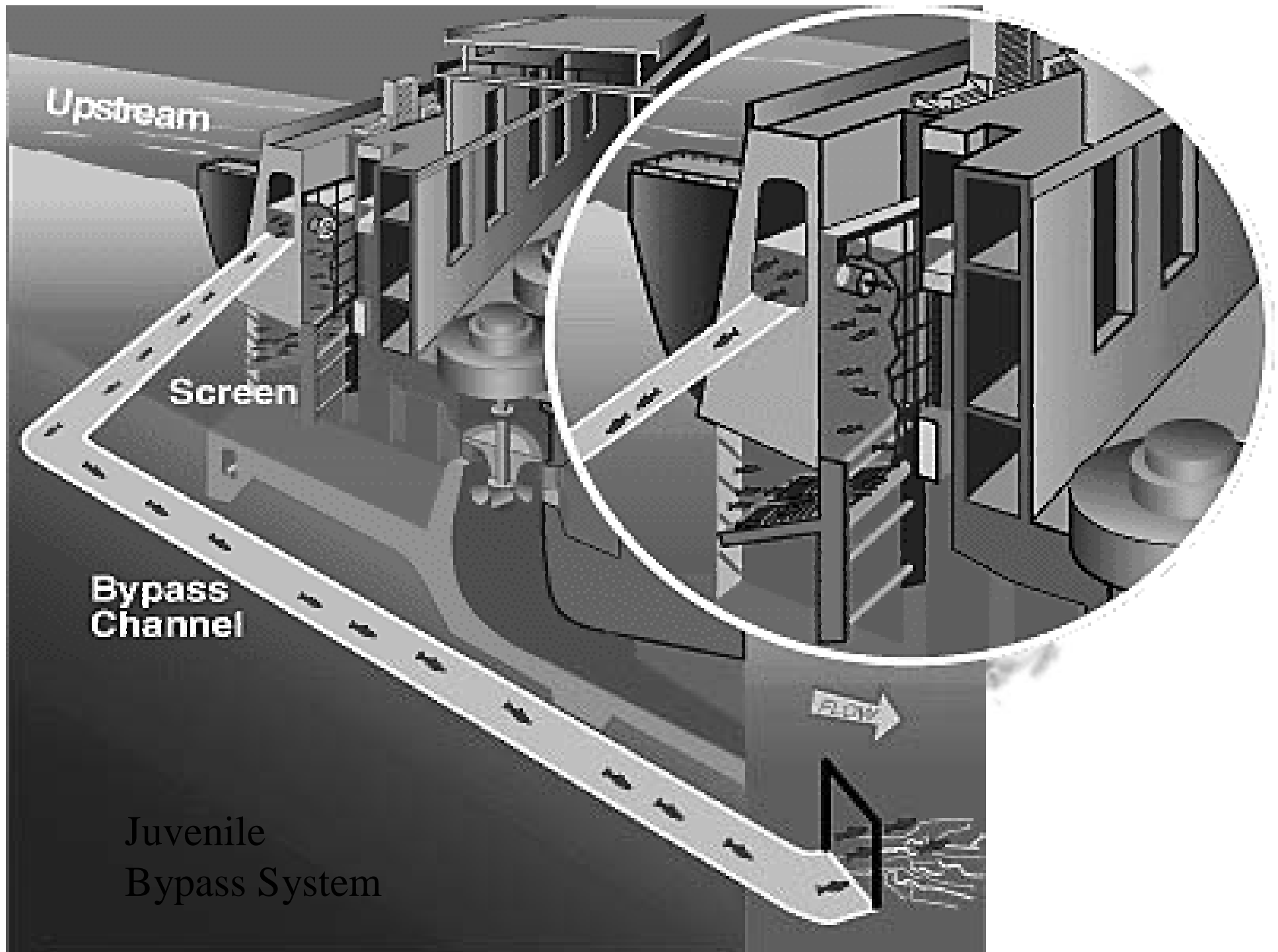
SRW

FFDR

- 
- Orchard
  - Workshops & Engage
  - Develop research
  - Annual solicitation & review of proposals
  - Develop final products to implement
  - Annual research review

# Navigation Channel







# Wetland Creation and Enhancement at the Kootenai River

